

A membrane exchange humidifier employs a water permeable membrane comprising a microporous polymer and a hydrophilic additive. In operation, the membrane preferably has favorable water transmission properties and resists transmission of reactant gas or other components. The membrane is suitable for use even when permeable in its dry condition to the wet or dry gases in the humidifier, and/or when the wet and dry gases are of different composition. By wetting the membrane, the presence of an amount of liquid water in the wet gas can reduce gas transmission through the membrane to an acceptable level. The humidifier is useful in fuel cell systems in which a reactant gas supply stream, such as the oxidant supply stream, is humidified primarily using water vapor from a fuel cell reactant exhaust stream. The humidifier is particularly suitable for use in conjunction with solid polymer fuel cell systems. The improved mechanical and welding properties of the membrane allow for a simpler humidifier configuration.